

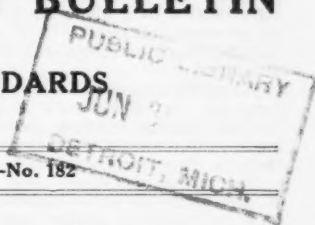
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CONTENTS

Airplane rudders.
Combustion processes in aircraft engines.
National conference on weights and measures.
Testing of clinical thermometers.
Analytical methods for photographic emulsions.
A standard ultra-violet dosage intensity meter.
The isoelectric point of wool.
Measurement of the pH of rubber latex by the antimony electrode.
Deterioration of paper in acid-polluted air.
Weather resistance of pottery glaze.

Glass phase in fired clay materials.
Use of Brinell test on Keene's cement.
Autoclaving as a durability test for concrete aggregates.
New National Directory of Commodity Specifications.
Standards Yearbook for 1932.
Revised stresses in wood poles for overhead electrical lines.
New and revised publications issued during May, 1932.
Recent articles appearing in outside publications.

AIRPLANE RUDDERS

The behavior of an airplane with respect to recovery from a spin has a most important bearing on its safety. The Air Commerce Regulations have rather stringent requirements as to the ease and quickness of recovery, requiring recovery in $1\frac{1}{2}$ turns with controls neutral. The studies of recovery from a spin carried out in this country and abroad have indicated that the most useful control in stopping the spin is the rudder. Hence, a knowledge of the effectiveness of rudders as dependent on various design factors is most desirable.

Previous studies of the effectiveness of rudders have usually been made in connection with the design of a particular airplane. By the method of trial and error, an arrangement of the vertical surfaces is found which gives a satisfactory yawing moment for a given angular displacement of the rudder as judged by comparison with measurements on models of airplanes whose rudder control is known to be satisfactory. Such measurements do not readily lend themselves to analysis or to the determination of the influence of the several factors, such as the area and aspect ratio of the vertical tail surfaces, on the magnitude of the yawing moments. An investigation recently conducted at the bureau repre-

sents a beginning at least of a systematic study of the effect of the area and the aspect ratio of the vertical surfaces, of the angle of pitch, and of the shape of the fuselage on the yawing moments produced by rudder displacement.

The effectiveness of a rudder is approximately proportional to its angular displacement for angles less than 25° . The effectiveness continues to increase with increasing rudder angle at approximately the same rate for rudders of small aspect ratio, but for rudders of large aspect ratio, the rate of increase falls off rapidly above rudder angles of 25° . The value of the rudder moment, however, is never less than for corresponding rudders of small aspect ratio. The term "aspect ratio" means roughly the ratio of the width of the vertical tail surface measured perpendicular to the airplane fuselage to the length measured along the fuselage.

The effect of increasing the angle of pitch is to decrease greatly the control at a given rudder angle; the decrease being greatest for rudders of large aspect ratio, when the rudder angle is less than 25° ; but when the rudder angle is large (44°), the decrease is greatest for rudders of small aspect ratio.

The effect of the shape of the fuselage is quite noticeable, being espe-

cially marked in the case of the cabin fuselage. The shielding effects are such for the cabin fuselage that the effectiveness at a given rudder setting at an angle of pitch of 40° is about two-thirds of that for the open cockpit fuselages.

When the aspect ratio is maintained constant, the effectiveness of the rudder is linearly related to the area ratio, but increases somewhat faster than in direct proportion.

The effect of aspect ratio is sufficiently large to be considered in design. If rudder angles approaching 45° are permitted, the effect of increasing the aspect ratio is small and may be ignored for practical purposes, although at high angles of pitch, large aspect ratio is appreciably favorable. If the rudder angle is restricted to 25° or less, an increase of rudder control of 30 to 45 per cent may be produced by increasing the aspect ratio from 1 to 2.

COMBUSTION PROCESSES IN AIRCRAFT ENGINES

In aircraft, to secure the most horsepower per pound of engine weight and maximum cruising range without refueling it is necessary to use supercharged engines of high compression ratio. Such engines will overheat and may suffer serious mechanical damage if the combustion phenomena known as preignition and detonation occur. Preignition commonly arises from overheated spark plugs or inadequately cooled exhaust valves and shows itself by loss of power and a tendency to back-fire. Detonation is what the motorist calls "knock" and commonly results from using unsuitable fuel. Continued detonation will heat the cylinder head until preignition sets in.

Experiments on combustion in engines, made in various laboratories for the purpose of learning more about the nature of detonation, were discussed by H. K. Cummings of the bureau at a recent aeronautical meeting of the American Society of Mechanical Engineers in Buffalo. These experiments indicate that a narrow combustion zone proceeds from the spark plug at a rate depending on engine speed and carburetor adjustment and that detonation usually does not occur until this burning zone has nearly crossed the combustion chamber. In the event of detonation the remaining portion of the charge, which is already heated and highly compressed, burns with extreme rapidity. This rapid burning of the last portion of the explosive charge probably is due to compression and

temperature rise and to chemical actions which have taken place during the compression of the charge. The only known effect that adding tetraethyl lead to a gasoline has on combustion is to prevent the ultra-rapid burning of a portion of the charge and the accompanying abrupt pressure rise which constitute the knock. Precisely how this is accomplished, has not been established as yet.

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

The Twenty-Fifth National Conference on Weights and Measures was to be held in Washington early in June. However, in the interest of conservation of public funds it seemed advisable to postpone the conference till next year and a proposal to this effect by the officers was approved by an almost unanimous vote of the Executive Committee. Consequently no conference will be held during 1932.

TESTING OF CLINICAL THERMOMETERS

The testing of clinical thermometers by the Bureau of Standards consists in determining whether the thermometers meet certain requirements as to construction, accuracy, and reliability. Thermometers which meet these requirements are marked as evidence that they have been tested and found satisfactory by the bureau. At present, the requirements are identical with those of Commercial Standard CS1-28, which was adopted in 1928. Experience at the bureau and elsewhere had indicated the need of some changes in this standard, and accordingly a revision was submitted to the industry in the early part of this year, and was accepted. Acceptance of the revision, which will be known as CS1-32, was announced by the division of trade standards on March 30, to become effective on June 1, 1932.

The new standard will be used by the bureau as the basis of its requirements and testing procedure, effective July 1, 1932. Thermometers submitted for test after that date must meet the requirements of CS1-32 as to construction and aging, and will be subjected to the tests prescribed.

Thermometers which are found to meet the requirements are marked with the letters "B. S." and the last two numbers of the calendar year; thus thermometers tested during 1932 will be marked "BS-32." This marking is used in lieu of a certificate and is evidence that the thermometers have been found to comply with the requirements

of the bureau and of the Commercial Standard.

The fee for testing 10 thermometers or any smaller number submitted at one time, is \$1. If more than 10 thermometers are submitted for test, the fee is 10 cents each. These fees are subject to revision from time to time.

ANALYTICAL METHODS FOR PHOTOGRAPHIC EMULSIONS

The sensitivity of photographic emulsions depends to a large extent on the presence of nuclei on the grains of silver bromide. These nuclei consist of silver in other forms; silver sulphide is known to be present, and metallic silver is quite possible. At the bureau a critical study has been made of the analytical methods proposed for the determination of the silver present in these forms in an emulsion. It is found that reliable results can be obtained by the method of Weigert and Lühr, which consists of a double fixation with sodium thiosulphate ("hypo") and extensive washing, after which the silver remaining is determined by electrometric titration. The tests of the method go considerably further than those of the originators. The results at the bureau confirm the unexpected discovery of the German investigators that unexposed emulsions contain silver or silver sulphide in quantities greater than that involved in the formation of the latent image.

Another important constituent of emulsions is the trace of soluble bromide which acts as a preservative. Determination of soluble bromide based on simple extraction with water may give results that are much too high because of the formation of silver-gelatin compounds (report of which was published in B. S. Research Paper No. 376) and consequent decomposition of the silver bromide. This error may be avoided by extracting the bromide with dilute acid.

The complete discussion of this work will be published as Research Paper No. 447 in the June number of the Bureau of Standards Journal of Research.

A STANDARD ULTRA-VIOLET DOSAGE INTENSITY METER

During the past two years an investigation has been in progress at the bureau on various methods of measuring ultra-violet radiation useful for healing purposes. The demand for such information arises from the fact that numerous kinds and varieties of

ultra-violet light sources are being offered to physicians and to the public, and practically no exact data are available regarding their effective ultra-violet output. This is partly owing to the fact that there are no intensity (dosage) meters available for accurately evaluating the ultra-violet emitted.

Assuming that the lamps emit sufficient ultra-violet to produce a therapeutic effect, it is important to determine the amount that can be applied without burning the patient. This depends upon the tolerance of the skin, the susceptibility of which varies greatly for different persons, and even for the same person, depending upon moisture and temperature conditions of the atmosphere.

In the present investigation, which will be fully described in Research Paper No. 450 in the June number of the Bureau of Standards Journal of Research, the amount of ultra-violet that can be safely applied to the skin, which is determined by the erythema produced, is correlated with the energy measurements. The experimental procedure consisted in comparing the erythema produced (on, say, the inner forearm) by a measured amount of homogeneous radiation of the wave length 297 millimicrons, used as a standard, with the erythema produced by a measured amount of heterogeneous ultra-violet radiation, from various sources, evaluated by means of the balanced thermocouple and filter radiometer.

A very close agreement was found between the erythema and the radiometric evaluation of the ultra-violet emitted by various sources which differed very markedly in ultra-violet spectral energy distribution; including, as extremes, the sun, which has practically no ultra-violet radiation of wave lengths less than about 290 millimicrons, and the so-called cold quartz mercury vapor lamp in which over 95 per cent of the total erythemogenic ultra-violet radiation is contained in the resonance line at 254 millimicrons. Other sources examined were the Mazda S-1 and S-2 mercury arc lamps in Corex D bulbs, the high temperature quartz mercury arc lamp and the carbon arc lamp with "therapeutic B. C. and white flame" electrodes.

Based upon a general survey of the biological and radiometric data available, the conclusion reached is that, in order to insure effective therapeutic results, the radiant flux from the source of heterogeneous ultra-violet radiation of wave lengths less than

and including 313 millimicrons, evaluated according to the standard spectral erythemal response curve, should not be less than the erythemogenic equivalent of 20 microwatts per square centimeter of homogeneous radiation of the wave length of maximum erythemal effectiveness, which wave length, for practical purposes, is taken at the emission line of mercury, at 297 millimicrons (2,967Å).

For the various sources of heterogeneous ultra-violet radiation of wave lengths less than and including 313 millimicrons, the erythemogenic equivalent of 20 microwatts per square centimeter of homogeneous radiation of wave length 297 millimicrons, in microwatts per square centimeter, is approximately as follows:

Sun -----	91
Mazda S-1 lamp -----	80
Mazda S-2 lamp -----	93
Quartz mercury arc -----	58
So-called cold quartz mercury vapor lamp -----	36
Carbon arc -----	45-90
Mazda CX tungsten filament -----	130

In this paper the unit of dosage is discussed, and 10,000 ergs per square centimeter of homogeneous radiation of the mercury arc at the wave length of 297 millimicrons is suggested for the erythemogenic unit of dosage.

THE ISOELECTRIC POINT OF WOOL

One phase of the research work of the American Association of Textile Chemists and Colorists in progress at the Bureau of Standards is a study of the fundamental properties of wool. Research Paper No. 451, which will be published in the June number of the Bureau of Standards Journal of Research, reports a determination of the isoelectric point of wool, a value which is significant in the processing and laundering of textiles made from this fiber.

Raw wools from Idaho and from Australia were thoroughly cleaned by extraction with an organic solvent. New worsted cloth was scoured with soap and then extracted. Suspensions of these wools in buffer solutions of different pH values were prepared by grinding the dry wool to a fine powder and shaking the powder in the buffer solution. The movement of the particles produced by placing the suspension in an electric field was measured. The pH at which the electrophoretic velocity of the wool particles was zero; that is, the isoelectric point of the wool, was found to be 3.4.

Not only did the wools studied come from widely separated localities but their nitrogen content was slightly different. If the difference in nitrogen content is indicative of a difference in structure of the wool, the results point to the fact that the isoelectric point is very slightly or not at all affected by small differences in compositions.

The theory and application of electrophoresis measurements to suspensions of wool are discussed in the paper. The electrophoretic mobility of wool particles was found to be independent of their size and shape in the size range from 5 to 9 microns.

MEASUREMENT OF THE pH OF RUBBER LATEX BY THE ANTIMONY ELECTRODE

The antimony electrode is being investigated at the bureau as a means of determining the pH of the ordinary ammonia-preserved rubber latex. Measurements that have been made on latex samples ranging from pH 8 to pH 11 indicate that this electrode gives constant and reproducible readings and is free from disadvantages inherent in other types of electrodes when used in latex. The hydrogen electrode can not be employed in latex on account of the deposition of rubber on the platinum black surface. The quinhydrone electrode gives erroneous results when the latex is in the strongly alkaline range above, say, pH 8.5. The glass electrode, on the other hand, has given good results with latex, but has the practical disadvantage that either an electrometer or a vacuum tube galvanometer is required to measure the electromotive forces through the high resistances that are involved. The antimony electrode, however, can be used with ordinary electrometric apparatus which is relatively simple in operation.

The antimony electrode is used in the form of a cast stick of the chemically pure metal, and is calibrated in appropriate buffer solutions against the hydrogen electrode.

This work is being done in connection with the development of a general procedure for making laboratory test specimens directly from rubber latex by electrodeposition.

DETERIORATION OF PAPER IN ACID-POLLUTED AIR

The effect of small amounts of sulphur dioxide upon current commercial book and writing papers has been studied by the bureau, and the results are

now available in printed form. Fourteen different commercial book and writing papers were exposed for 10 days to the action of air containing 2 to 9 parts of sulphur dioxide per million. At the end of that time it was found that the papers had suffered a considerable decrease in folding strength, 40 per cent in some cases, and had undergone changes in chemical characteristics.

The effect of sulphur dioxide, released into the atmosphere by the combustion of modern fuels, has been the subject of many investigations. (Technical News Bulletin No. 177, p. 4, January, 1932.) A study of statistics obtained from reports of these investigations, covering 15 American and European cities, showed air pollutions ranging from 0.20 to 3.00 parts sulphur dioxide per million and an annual precipitation of sulphuric acid ranging from 11 to 190 tons per square mile. Additional evidence of the increasingly polluted nature of modern urban atmospheres resulted from a recent investigation by the bureau of the causes of the so-called "winter damage" or rotting of damp cotton fabric upon exposure to outside air, experienced by laundries throughout New England. (Technical News Bulletin No. 167, p. 31, March, 1931.) Atmospheric sulphur dioxide, which is oxidized on the fabric to sulphuric acid, was found to be the cause of the phenomenon.

The initial quality of the papers was apparently no measure of their resistance to the action of sulphur dioxide, since some of the low-grade papers, unsuitable for permanent record use, as determined by the usual tests, suffered less from exposure to this gas than did high-grade papers. This fact adds to the evidence in favor of the modification of library ventilating systems so as to eliminate from the library air, so far as practicable, any acid pollution introduced by the admission of outside air.

The research reported is one phase of a general study of library storage of records being made at the bureau with the assistance of a fund granted for the purpose to the National Research Council by the Carnegie Corporation. The report is contained in Research Paper No. 407, entitled "The Deteriorative Effect of Sulphur Dioxide upon Paper in an Atmosphere of Constant Humidity and Temperature." Copies may be obtained from the Superintendent of Documents, Washington, D. C., at 10 cents each.

WEATHER RESISTANCE OF POTTERY GLAZE

A specimen of each of 10 brands of chinaware (7 vitreous and 3 earthenware) and 3 specimens of colored glazed tile were exposed to the weather for one year. The "gloss" of three glazes (one earthenware and two vitreous), measured by means of the Ingersoll glarimeter, had decreased from 3 to 4 per cent, while the glaze on one earthenware plate (imported) had decreased 8 per cent. Only the latter change is considered significant. The "gloss" on the unexposed plates and the tile varied from 95 to 98 per cent and on the exposed plates from 88 to 98 per cent. Although the overglaze colors appeared somewhat duller, they had changed very little with the exception of blue, or combinations containing blue, which had faded noticeably. On one plate the lavender background of a border design had changed to orchid. The most interesting development was what appeared to be a decomposition of some of the glaze or of the brown and green underglaze striping. The result was a "scummy" appearance of the glaze immediately over and adjacent to the colors. It may be due to defects in the glaze itself, which permitted reaction with the weakly acid rain waters. If the effect noted is due to decomposition of the coloring oxides, it is possibly brought about by the action of sunlight.

GLASS PHASE IN FIRED CLAY MATERIALS

The strength and durability of ceramic products depend partly on the formation during the firing process of a glass phase which binds together the mineral grains of the material. Only in rare cases does the durability of the material depend alone on the presence of interlocking or fitted crystals with no glassy bond. The properties of fired clay wares becomes more dependent upon their glass phase the nearer they approach complete vitrification in the kiln. In extreme cases, such as completely vitrified ware and glass ware, obviously the properties of the glass phase entirely determine the properties of the ware.

Because of the importance of this matter a study is being made to determine the nature of the glass phase in fired clay materials, physical measurements being made on annealed glasses whose compositions are known. Three methods used in this investigation are (1) to fuse to a homogeneous glass the material such as an analyzed china

clay and determine the physical properties of the resulting glass; (2) to fuse to a glass those eutectics which possibly occur in the clay and make the physical measurements of the glasses; and (3) to study the glasses resulting from fusion of mixtures of definite composition in a 4-component system.

In the selection of raw materials, mixing of the weighed batches and fusion to a glass, great care is taken to prevent the introduction of impurities. Whenever possible the fusion is conducted in platinum. A sufficient number of fusions, with fine grinding after each, are made until microscopic examination shows that the resulting glasses are homogeneous. The sample of glass is then annealed and the physical measurements made on it. These measurements include coefficient of expansion and softening point, Young's modulus of elasticity, density and specific volume, index of refraction, and tensile strength. Studies have been made on glasses resulting from fusion of five pure china clays; five eutectics in the $K_2O-CaO-SiO_2$ system; and a portion of the tetrahedron rich in silica in the 4-component system $K_2O-CaO-Al_2O_3-SiO_2$. Tests have also been made on blends of these glasses with muscovite, and with the eutectics between anorthite, mullite and SiO_2 .

USE OF BRINELL TEST ON KEENE'S CEMENT

Keene's cement, which is a type of dead-burned gypsum plaster, is commonly regarded as possessing certain advantages over ordinary plaster of Paris for plaster work. Of these advantages, the main one is that of hardness of surface. Therefore, when the properties of Keene's cement were being investigated with a view toward formulating Federal specifications, it was suggested that the Brinell hardness test, such as is used for testing metals, be tried on castings made from the various types of Keene's cement, as well as the ordinary calcined gypsum (plaster of Paris).

Tests were made on 2-inch cubes made from nine different Keene's cements. Three consistencies of each material were used. A few tests were also made on cubes cast from plaster of Paris. A pressure of 500 kg was applied for one minute through a steel ball 17.5 mm in diameter on to the surfaces of the cubes. Four tests were made on each cube, one on each of the surfaces cast in contact with the mold. The diameter of the resultant indentation was measured by means of a

micrometer microscope to the closest 0.1 mm. The Brinell number is the load per unit of spherical surface of contact.

In some cases, mostly among the specimens of regular plaster of Paris, the specimens broke when the load was applied. Strength tests on other cubes cast of the same materials showed that these castings had in all cases a compressive strength of 3,000 lbs./in.² Of those materials which did not break, only one mix gave a strength below 3,200 lbs./in.² in compression.

The indentations ranged from 6.7 to 9.7 mm (Brinell numbers of 14.4 to 6.3) for the Keene's cements tested. The cubes made from the calcined gypsums either broke because of their lower strengths or gave indentations slightly larger than 9.7 mm. Test specimens made from a special type of dental plaster gave the low indentation of 5.8 mm.

It was found that the compressive and tensile strengths are both related to the Brinell number, the higher the strengths the larger the Brinell number or the smaller the indentation. The compressive strength of the Keene's cements ranged from 5,760 to 3,070 lbs./in.², the mixes showing these extreme values being the same as those which gave the extreme Brinell numbers. The special dental plaster showed a compressive strength of 9,300 lbs./in.²

From the data obtained it would appear that the Brinell test might be better than the strength tests in testing Keene's cement. It measures more directly the property desired in the material and is also a very simple test which can be performed in a short time. The several tests on the same cube and those from other cubes of the same mix checked within 0.3 mm in all cases.

AUTOCCLAVING AS A DURABILITY TEST FOR CONCRETE AGGREGATES

Among the various methods for testing concrete aggregates to obtain an estimate of their durabilities, those which are generally conceded to give the most reliable indications require so much time as to be unusable. It has been suggested that an autoclave test, similar to the one sometimes used as a soundness test for cement, might be useful for detecting the likelihood of aggregates to expand during exposure. This test would have the advantage of speed, provided that one or two autoclavings were sufficient. A few tests of aggregates were made to determine whether or not indications

of durability could be detected by subjecting them to a few cycles of autoclaving and drying.

The Bureau of Public Roads cooperated by furnishing 14 samples of aggregates, including 3 of dolomite, which had been judged unsuited for use in concrete pavements. These were submitted to two treatments in steam at a pressure of 600 lbs./in.² for 5 hours and 12 treatments in water at 150 lbs./in.² pressure (360° F.) for 24 hours. The specimens were dried at 230° F. for about 17 hours between each test. The three poor aggregates showed a very slight amount of disintegration. The time required, however, was too long for the test to be useful in specifications.

Samples of the aggregates were submitted to 20 cycles of boiling in water for 5 hours, followed by 17 hours of drying at 230° F. The unsatisfactory specimens showed about the same amount of disintegration as with the autoclave tests. This test was also too slow for use as a specification test.

Samples of the three poor aggregates were crushed to pass a No. 4 sieve. These, with two samples of poor fine aggregates furnished by the Bureau of Public Roads and a sample of shale, were made into pats with a 1:1 by weight cement-sand mortar. One set of these pats was tested in steam at 880 lbs./in.² pressure for 24 hours. There was no disintegration in any of them. Another set was subjected to 10 cycles of boiling for 5 hours and drying at 230° F. for 17 hours without showing signs of disintegration. Similar mortar pats of mixtures of Portland cement, plaster of Paris, and fine aggregates were disintegrated by an autoclave treatment, but the disintegration was about the same with the sound as with the unsound aggregates.

The results of the tests indicate that the autoclave test, in which the pressures are built up and released slowly, does not offer much promise of being a satisfactory one for including in specifications for aggregates.

NEW NATIONAL DIRECTORY OF COMMODITY SPECIFICATIONS

The bureau's Miscellaneous Publication No. 130 which was released last month is the second edition of the Directory of Specifications first issued in 1925. It contains an alphabetical list of commodities and a thoroughly classified list of the specifications formulated by organizations having national recognition or agencies speaking with the authority of the Federal

Government as a whole. A special effort has been made to increase the usefulness of the directory. Thus, if the use to which a commodity is put is not self-evident from the title of the specification, a brief explanation is given. A summary of each specification is also included so that the reader may to some extent judge for himself whether the scope of the specification fits his particular needs. The work has been carried on cooperatively by the Bureau of Foreign and Domestic Commerce and the Bureau of Standards, in accordance with detailed plans formulated or approved by an advisory board composed of representatives of 14 national organizations interested in the preparation and unification of specifications, as follows: American Electric Railway Association, American Standards Association, American Hospital Association, American Hotel Association, American Society for Testing Materials, Associated Business Papers (Inc.), Associates for Government Service (Inc.), Chamber of Commerce of the United States, National Association of Manufacturers, National Association of Purchasing Agents, National Conference of Business Paper Editors, National Conference of Governmental Purchasing Agents, National Electric Light Association, and the Society of Automotive Engineers.

Copies of the new directory bound in green buckram may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at \$1.75 each.

STANDARDS YEARBOOK FOR 1932

The increasing importance of standardization in the United States and abroad, and the principal developments in this field during the past year, are discussed in the 1932 Standards Yearbook, which was released by the bureau last month.

Subjects covered in this book range from accident prevention to zoning systems and include references to important work having a direct bearing on reducing the cost to the public and aiding the manufacturers of a wide range of articles.

The sections on national and international standardizing agencies contain information not found elsewhere in one volume. In fact, it would be almost impossible for any individual to secure such a complete report because of the difficulty of searching through all the original sources.

To the nontechnical reader, the first section of the Yearbook, a symposium

on standardization in communication, will doubtless prove one of the most interesting features. This section is made up of short articles contributed by the world's recognized leaders in every field of communication from racing pigeons to radio and from language to optical waves. Standardization is the basis of all communication, though the extent of this development is but little appreciated by the layman.

Other sections of the book contain brief reports of the work of standardizing bodies within the Federal Government and of States, counties, and municipal agencies, as well as technical societies and trade associations.

The book contains numerous evidences of the value of standardization in many lines of commerce and industry. From the standpoint of conservation of life alone, the work in progress in various lines of transportation to standardize signals and warning devices is very important.

Copies of the Standards Yearbook may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for \$1 each.

REVISED STRESSES IN WOOD POLES FOR OVERHEAD ELECTRICAL LINES

Since the publication of the fourth edition of the National Electrical Safety Code, the American Standards Association has approved higher values for the ultimate fiber stresses of chestnut, Western red cedar, and Southern pine, three materials which have been very extensively used in electrical line construction. The rule of the National Electrical Safety Code which involves these strength values made provision for the acceptance of the new values after approval by the American Standards Association. The establishment of these new values makes certain tables in the code obsolete. Therefore the bureau has published Handbook H-16 for the purpose of supplying new data and tables which are derived from the revised values of the ultimate fiber stresses of these woods. This publication consequently reproduces the paragraphs from the National Electrical Safety Code dealing with strength of wood poles and also the tables given in Appendix F which are similarly affected. In addition new tables are given for the bending moments due to wind pressures upon poles of various heights and circumferences.

Copies of this handbook may be obtained from the Superintendent of

Documents, Government Printing Office, Washington, D. C., at 10 cents each.

NEW AND REVISED PUBLICATIONS ISSUED DURING MAY, 1932

Journal of Research¹

Bureau of Standards Journal of Research, vol. 8, No. 5, May, 1932 (RP Nos. 434 to 445, inclusive). Price, 40 cents. Obtainable by subscription.

Research Papers¹

(Reprints from Journal of Research)

RP407. Deteriorative effect of sulphur dioxide upon paper in an atmosphere of constant humidity and temperature; A. E. Kimberly. Price, 10 cents.

RP408. Tensile properties of rail steels at elevated temperatures; G. W. Quick. Price, 5 cents.

RP409. The resistance to impact of rail steels at elevated temperatures; G. W. Quick. Price, 5 cents.

RP410. Kaolins; effect of firing temperature on some of their physical properties; R. A. Heindl, W. L. Pendergast, and L. E. Mong. Price, 5 cents.

RP411. Composite-coil electrodynamic instruments; F. B. Silsbee. Price, 10 cents.

RP412. Some studies of radio transmission over long paths made on the Byrd Antarctic expedition; L. V. Berkner. Price, 10 cents.

RP413. Phase equilibria in the system $\text{SiO}_2\text{-ZnO-Al}_2\text{O}_3$; E. N. Bunting. Price, 5 cents.

RP414. System $\text{CaO-Na}_2\text{O-Al}_2\text{O}_3$; L. T. Brownmiller and R. H. Bogue. Price, 5 cents.

RP415. Determination of tin in irons and steels; J. A. Scherrer. Price, 5 cents.

RP416. Heat of vaporization of water at 50°, 70°, and 90° C.; E. F. Fiock and D. C. Ginnings. Price, 5 cents.

RP418. The course of the oxidation of the aldose sugars by bromine water; H. S. Isbell and C. S. Hudson. Price, 5 cents.

¹ Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 25 cents per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and Republic of Panama); other countries, 40 cents. Subscription to Journal of Research, \$3 per year; other countries, \$3.75. Subscription to Commercial Standards Monthly, \$1 per year; other countries \$1.25.

RP420. Gases obtained from commercial feldspars heated in vacuo; G. R. Shelton and H. H. Holscher. Price, 5 cents.

RP422. Accelerated weathering tests of soldered and tinned sheet copper; P. R. Kisting. Price, 10 cents.

RP423. The chromium oxide and the vanadium oxide band spectra; W. F. C. Ferguson. Price, 5 cents.

RP425. The arc spectrum of phosphorus; C. C. Kiess. Price, 10 cents.

RP430. The photographic emulsion: silver-ion and hydrogen-ion concentrations and sensitivity; B. H. Carroll and D. Hubbard. Price, 10 cents.

Circulars¹

C398. Standard samples—General information. (Revision of C25, ninth edition.) Free on application to bureau.

Simplified Practice Recommendations¹

R64-30. One-pound folding boxes for coffee. Price, 5 cents.

R122-31. Wire insect screen cloth. Price, 5 cents.

R130-32. Dental lathe grinding wheels. Price, 5 cents.

Commercial Standards¹

CS37-31. Steel bone plates and screws. Price, 10 cents.

Handbooks¹

H16. Wood poles for overhead electrical lines. Price, 10 cents.

Miscellaneous Publications¹

M118. The optical rotation of liquids, its variation with wave length, temperature, solvent, and concentration; T. Martin Lowry. Price, 10 cents.

Commercial Standards Monthly¹

Commercial Standards Monthly, vol. 8, No. 11, May, 1932. Price, 10 cents. Obtainable by subscription.

Technical News Bulletin¹

Technical News Bulletin No. 181, May, 1932. Price, 5 cents. Obtainable by subscription.

¹ Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 25 cents per year (United States and its possessions, Canada, Cuba, Mexico, Newfoundland, and Republic of

OUTSIDE PUBLICATIONS²

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